1/25/01 e-mail from Tim

Al,
The language below represents our position with respect to OLSQVs, as per your request. If you would like to discuss this issue, please contact me.
Thank you,
Tim

There are a number of ecological risk assessment approaches which should be evaluated while developing Onondaga Lake Sediment Quality Values (OLSQVs) which could be used as remedial action objectives (RAOs) during the Feasibility Study. In addition, ARARs, TBCs and human health based sediment values should also be considered while developing RAOs. The No Observed Effect Level (NOEL) value derived from sediment toxicity testing is a value that represents the most protective ecological endpoint. However, the NOEL might be overprotective, in that it might not discriminate between toxicity resulting from the contaminant of interest (COI) and other causes. There are various other sediment toxicity metrics that can be calculated, based on site-specific Onondaga Lake data, which are more discriminating and thus, more accurate for a given COI. These include Effects Range Low (ERL) and Effects Range Median (ERM) values based on Long and Morgan's methodology (Long and Morgan, 1990), Threshold Effect Level (TEL) and Probable Effect Level (PEL) values based on MacDonald's methodology (MacDonald, 1993), and the Apparent Effect Thresholds (AETs) (PTI, 1988). The AET approach is the least protective of these sediment toxicity metrics. Therefore, the Department requires that the five aforementioned sediment toxicity metrics be calculated for the ecological contaminants of concern, based on the site-specific data. The resultant values should be included in the revised Baseline Ecological Risk Assessment (BERA) Report. In addition, the stations exceeding these thresholds should be mapped in the revised BERA. These sets of ecological values should be presented separately for the 1992 data and the 2000 data (benthic community, sediment toxicity and sediment chemistry).

Although the process of evaluating these ecological risk assessment values, in order to generate RAOs, is generally conducted during the FS phase; starting this process now should facilitate development of an approvable FS in a timely manner. Therefore, the following information is provided for Honeywell's consideration in developing RAOs.

The Department rejects the use of the Adverse Effects Threshold (AET) methodology as the sole basis for determining OLSQVs because it minimizes, actually eliminates, type 1 errors (sites that are actually clean although predicted to be contaminated) at the expense of type 2 errors (sites that are actually contaminated although predicted to be clean) . Therefore, the use of AETs, as cleanup criteria, will leave potentially contaminated sites that show biological effects (i.e., toxicity) unmitigated. For example, using the 1992 chironomid growth test results and the mercury data, Honeywell/Exponent determined the AET to be 5.5 mg/kg Hg. The No Observed Effects Level (NOEL) was 1.6 mg/kg Hg based on the 1992 data. Based on Exponent's determination of affected stations and the data presented in the tables provided at the January 19, 2000 meeting, there were 29 sample sites where the sediment concentration was <5.5 and >1.6 mg/kg Hg, 13 of which showed toxicity (the 29 individual sites represented 17 individual concentrations, 9 of which showed toxic effects). Exponent contends that toxicity at sites with contaminant concentrations below AET thresholds are probably attributable to some other cause besides the particular contaminant of interest. That cannot be taken for granted. AETs may be acceptable if a thorough Toxicity Identification Evaluation (TIE) was conducted at each site at which the concentration of the contaminant of interest (COI) was below the AET and toxicity occurred, and an alternative cause for toxicity was positively attributed.

There are a number of methods for deriving empirical site-specific sediment criteria, most of which require the selection of an arbitrary effects level.

Alternatively, the Department proposes an approach for assessing ecological OLSQVs that is loosely based on Theresa Michelsen's error-analysis approach. The Michelsen approach does not directly calculate sediment thresholds from an evaluation of effects/no effects COI concentrations using arbitrary percentiles. Her approach allows for the selection of an acceptable type 1 error level. The type 2 error level can than be calculated from the sample data set. This approach is done iteratively until acceptable type 1 and type 2 error levels are achieved. The approach proposed by the Department is somewhat different. First, the NOEL and the AET are determined. Then, the type 1 and type 2 error rates are calculated at every concentration between the AET and the NOEL. The sediment criterion selected is the COI concentration at which the type 1 and type 2 errors are minimized relative to each other. For the 1992 Onondaga Lake chironomid growth data for mercury, this concentration would be 2.8 mg/kg Hg, corresponding to site S40 (based on Exponent's January 19, 2000 handout). The type 1 and type 2 error rates at this concentration are 0.24 and 0.23, respectively.

In addition, the Department rejects the designation of "primary" OLSQVs and "secondary" OLSQVs. There is no basis for such a designation. The sediment quality criterion selected should be based on the lowest COI concentration that shows a statistically significant biological effect, regardless of which of the five tests showed the effect (Hyalella acute, Hyalella chronic, chironomid acute, chironomid chronic, benthic community analysis).

It is noted that Exponent's determination of affected stations for the AET (both 1992 and 2000) will need to incorporate the benthic community metrics previously required by the Department. Differences in metric values (e.g., species diversity and Percent Model Affinity) calculated by the Department and Honeywell/Exponent based on the 1992 data, as per the December 7, 2000 meeting, necessitate that Honeywell should provide supporting documentation so that the Department can verify Honeywell's determination of impacted sites.